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AMERICAN FERTILIZER

" That man is a benefactor to his race who makes two blades of grass to grow where but one grew before "

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Rate of Nutrient Absorption by Different Varieties of Potatoes in Aroostook County, Maine*

By ARTHUR HAWKINS

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IT HAS been estimated that upwards of 80 pounds of nitrogen, 160 pounds of phosphoric acid (P_2O_5), 160 pounds of potash (K_2O), 30 pounds of magnesium oxide (MgO), and an undetermined amount of lime and sulphur in the form of mixed fertilizers are applied per acre of Maine's potato crop. Previous to this study the amount of these elements absorbed by a potato crop grown under Aroostook conditions had not been determined. The proportion of one element to another in the fertilizer formula and the total amount of each element applied to a potato crop has not been varied with variety. "The application of nutrients on a rational basis not only requires that the absorbing power of individual species for particular elements be known but that the optimum time for making these elements available to the roots of the growing plant should be considered."** Therefore it appeared advisable to determine the rate of plant food absorption by several varieties of potatoes having different lengths of growing periods. The varieties chosen were: Cobbler, early; Chippewa, intermediate; Green Mountain, late; and Smooth Rural (New York No. 2), very late. These varieties were grown under different rates of fertilizer treatment, namely, no fertilizer, 1,500 pounds, 2,000 pounds, 2,500 pounds, and 3,000 pounds of a 4-8-8 per acre, on Caribou loam having a pH of 5.2 and the following levels of readily available nutrients: P, medium; K_2O, medium; CaO, medium to low: MgO, low.

Twelve (three from each of four plots) uniformly spaced two-stalk plants of representative size of each variety were taken from plots receiving no fertilizer, 2,000-pound, and 3,000-pound applications of a 4-8-8 fertilizer, at ten-day intervals, from the time that the plants were about six inches high to the time of serious loss of foliage, by maturity or early and late blight. Analysis was made of both the plants and tubers of these harvests to determine the total amount of major nutrient elements taken into the plant to a given date.

In this preliminary report for the sake of brevity, data will be presented for the most part on harvests of the Green Mountain variety from the plots which received 2,000 pounds of a 4-8-8 fertilizer [containing 80 pounds of nitrogen (N), 160 pounds of phosphoric acid (P_2O_5), 160 pounds of potash (K_2O), 30 pounds of magnesium oxide (MgO), and an estimated 220 pounds of calcium oxide (CaO) and 75 pounds of sulphur (S)].

The amounts of the major nutrient elements absorbed by the Green Mountain variety at ten-day intervals are given in Table 1. These are calculated on the basis of a 100 per cent stand (plots were hand-planted, seed spaced 12 inches apart).

The data show that under 1939 conditions during the first fifty days after planting the Green Mountain variety absorbed 9 per cent of the total major nutrient elements while making

* Reprinted from Agricultural News Letter (Du Pont), Vol. 10, No. 1, Jan.-Feb., 1942.

** Lyness, A. S., Plant Physiology, 11: 665-688, 1936.

3 per cent of the season's growth. The remaining 97 per cent of the season's growth (7,266 pounds) was divided as follows: between 50 and 60 days after planting, 7 per cent; between 60 and 70 days, 15 per cent; between 70 and 80 days, 26 per cent; between 80 and 90 days, 15 per cent; between 90 and 100 days, 16 per cent, and between 100 and 110 days, 18 per cent.

Of the 91 per cent of the major nutrient elements absorbed between the fiftieth and the 110th day after planting, 69 per cent was absorbed from the fiftieth to the eightieth day.

Less than 16 pounds of nitrogen had been utilized by the plant during the first fifty days after planting, but over 85 pounds was absorbed between the fiftieth and the eightieth day.

Twenty-seven pounds of phosphoric acid (P_2O_5) was taken up by the plants and tubers during the season. The absorption of potash took place very rapidly after the fiftieth day. Until that time only 15 pounds had been absorbed, but in the next thirty days, 160 pounds was absorbed per acre, and at about twice the nitrogen rate.

Only two pounds per acre of magnesium oxide was found in the plants on the fiftieth day but over 18 additional pounds was absorbed by the eightieth day, and absorption took place until the last harvest, to bring the total amount absorbed to 30 pounds.

The Green Mountain variety absorbed 54 pounds of calcium oxide (CaO) and 12.2 pounds of sulfur.

The amount of each major nutrient element absorbed per acre by the four varieties of potatoes in 1939 is given in Table 2.

The two later varieties absorbed about 100 pounds more total major nutrient elements than the earlier varieties. The later varieties absorbed considerably more nitrogen, potash, calcium oxide, and, as compared with the Cob-

(Continued on page 24)

Table 1

Amount of Each Major Nutrient Element Absorbed per Acre by Potato Crop During Ten-Day Intervals of Growth (Green Mountain Variety), 1939

Period of Growth	Dry Weight produced per acre	Elements Absorbed per Acre by Plants*—Each Period: Nitrogen (N)	Phosphoric Acid (P_2O_5)	Potash (K_2O)	Magnesium Oxide (MgO)	Calcium Oxide (CaO)	Sulphur (S)	Total
Days	Pounds Per Acre							
0-50	237	15.8	3.2	14.9	2.0	3.7	1.0	40.6
50-60	499	25.1	3.6	47.2	4.0	9.4	1.6	91.9
60-70	1,099	36.5	4.9	64.1	7.4	15.6	3.4	131.9
70-80	1,866	23.0	7.4	52.6	6.9	11.4	1.7	103.0
80-90	1,088	10.5	1.3	11.5	2.9	5.9	0.5	32.6
90-100	1,141	7.4	3.5	16.8	3.8	3.6	2.9	38.0
100-110	1,336	22.1	3.2	0.0	3.5	5.0	1.1	34.9
	7,266	141.4	27.1	207.1	30.5	54.6	12.2	472.9
Days	Per Cent of Total							
0-50	3	11	12	7	7	7	8	9
50-60	7	18	13	23	13	17	13	19
60-70	15	26	18	31	24	29	28	28
70-80	26	17	27	25	23	21	14	22
80-90	15	7	5	6	10	11	4	7
90-100	16	5	13	8	12	6	24	6
100-110	18	16	12		11	9	9	9
	100	100	100	100	100	100	100	100

* Plants include tops, tubers, and most of the roots.

Table 2

Amount of Each Major Plant Food Element Absorbed per Acre by Four Varieties of Potatoes, 1939

Variety	Pounds of Each Nutrient Element Absorbed by Plants*: Nitrogen (N)	Phosphoric Acid (P_2O_5)	Potash (K_2O)	Magnesium Oxide (MgO)	Calcium Oxide (CaO)	Sulphur (S)	Total
Cobbler	102.6	21.4	172.1	18.7	44.9	10.6	370.3
Chippewa	103.1	23.3	163.6	26.6	39.3	10.6	366.5
Green Mt.	141.4	27.1	207.1	30.5	54.6	12.2	472.9
Rural	128.5	24.5	211.4	30.5	59.1	10.7	464.7

* Plants include tops, tubers, and most of the roots.

War Emergency Conferences

New England

Fully 100 persons attended the Southern New England Fertilizer Conference held jointly with the War Emergency Conference of Agricultural and Fertilizer Industry Leaders at Amherst, Mass., March 3rd and 4th. Attending the former were representatives of 16 fertilizer companies selling in New England, members of the staffs of all the agricultural colleges in New England, and other officials. Most of the foregoing also attended the War Emergency Conference, where State officials of the USDA, War Boards, the AAA, as well as Conservation Service, State Departments of Agriculture, and other agencies were also represented.

Director F. J. Sievers of the Massachusetts Experiment Station presided at the Fertilizer Conference sessions and addressed the evening session. A. F. Kingsbury, chairman of District 1, presided at the evening session, and Charles J. Brand of the National Fertilizer Association conducted the War Emergency Session.

F. W. Parker, E. I. duPont de Nemours & Co., spoke at the evening session on "The Relation of Fertilizers to Crop Production." "Plant Food from Coal," a motion picture produced by the Educational and Research Bureau for By-Product Ammonia, was shown. Under the general topic "Meeting Emergency Milk Goals," Dr. D. S. Fink, University of Maine, spoke on "Pasture Crops," with discussion led by Dr. A. R. Midgley of Vermont; Prof. J. L. Haddock, New Hampshire, spoke on the "Hay Crops," with discussion led by Prof. J. S. Owens, Connecticut; Prof. J. G. Archibald, Massachusetts, spoke on "Silage Crops and Preservatives," with discussion led by Prof. R. W. Donaldson, Massachusetts; and J. B. Abbott, American Cyanamid Co., led the general round-table discussion. A motion picture, "In the Clover," produced by American Potash Institute, was shown. Dr. M. F. Morgan, Connecticut Experiment Station, reported on fertilizer consumption in New England by grades and ratios, with discussion by M. H. Lockwood of Eastern States Farmers' Exchange; Prof. A. E. Wilkinson, Connecticut State College, spoke on "Vegetable Production under Present Conditions"; and Dr. George D. Scarseth, soil chemist, Purdue University, discussed "Diagnosis of Plantfood needs of Soils and Crops," with discussion led by Dr. Dale Sieling, Massachusetts State College. Many said that it was the best conference that has yet been held in New England.

T. E. Milliman, Office of Price Administration, outlined very clearly the objectives of OPA with respect to fertilizer prices and the policies that have been formulated to date.

John Scott, OPA attorney assigned to attend this series of meetings, explained and discussed Temporary Price Regulation No. 1 and discussed the Price Control Act briefly. A. W. Manchester, director, Northeast region AAA, spoke on "Victory Goals for New England" and told how the changes that have occurred during the past few months have necessitated increasing the goals that were set up last fall. S. B. Haskell, The Barrett Division, Allied Chemical & Dye Corp., made a brief statement concerning the present total nitrogen and nitrate of soda situations; and W. J. McCort of Chilean Nitrate Sales Corp., made a statement for his company. Mr. Brand discussed briefly the situation with respect to sulphuric acid and superphosphate, potash, containers, and transportation.

Virginia, North Carolina and South Carolina

The War Emergency Conference held at Rocky Mount, N. C., on March 6th, was attended by more than 150 persons including representatives of the industry from Virginia, North Carolina, and South Carolina; members of the staffs of the agricultural colleges and experiment stations of Virginia and North Carolina; members of State agricultural war boards; representatives of the AAA and SCS; and of State departments of agriculture.

Charles J. Brand of the National Fertilizer Association called the meeting to order, explained the purpose of the meeting, and presided during the day. T. E. Milliman analyzed the present situation as it relates to fertilizer prices. Dr. P. H. Groggins, Office of Agricultural Defense Relations, brought a greeting from Secretary Wickard and discussed the nitrogen balance sheet; the method of determining allocations of nitrate of soda; the present situation with respect to nitrate of soda, sulphuric acid, superphosphate, and insecticides. S. B. Haskell, The Barrett Division, Allied Chemical & Dye Corp., and Nelson Myers, Chilean Nitrate Sales Corp., made brief statements as to the nitrogen supply; and Dale Kieffer, American Potash Institute, made a brief statement concerning the potash situation.

John Scott, OPA attorney, explained Temporary Price Regulation No. 1; Dean I. O.

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More Fruit for the Duration

Contribution from Division of Pomology, Department of Horticulture, The Pennsylvania State College. Prepared by R. D. Anthony.

OUR boys in the armed forces need fresh fruit and large quantities of canned, preserved, and dried fruits. The civilian populations overseas look to this country for supplies of canned and dried fruit. The American fruit grower must increase his production to meet these needs. Furthermore, because of transportation difficulties, it is desirable that a considerable part of this increase be in the northeastern states.

Apples

The average yield of apples in the northeastern states is low. There should be no difficulty in securing very considerable increases with the present acreages if production problems are studied more carefully.

Soil Management. For more than ten years apple growers have been urged to put their orchards under some form of sod rotation. A considerable majority of orchards are now in sods of various ages and densities.

Much of our commercial supply of nitrogen is going into gun powder instead of fertilizers. Fruit growers will be able to get some nitrate fertilizers, perhaps as much as last year, but increased production of fruit demands more nitrate. This extra amount and, if necessary, some of our usual amount of nitrate can come from the organic matter we have built up in our soils with years of sod covers. Now that we need it, we have money in the bank. If the source of organic supply is strawey material low in nitrogen, there will be a temporary withdrawal of nitrogen from the soil to start this breakdown.

Cultivation which hastens the breakdown of the soil organic matter releases nitrate for tree growth. In the spring, as soon as the land can be worked, orchards which are in sod should be disced or harrowed. This working should be shallow and should check rather than destroy the cover.

If the spring is late and this breaking is close to the time of blossoming, top-dress the orchard with one hundred pounds of nitrate of soda per acre or its equivalent when the buds are in the pink. This is especially necessary if there is much strawey cover. If the cover is fresh grass which will break down quickly, this top dressing can be omitted or the fertilizer can be used in a ring application to stimulate tree growth.

The point to keep in mind is that the apple tree makes its heavy demand on the soil for nitrogen during the month following the break of the leaf buds. This demand can be met either from the reserves in the soil or from the fertilizer bag.

If the supply of soil organic matter has been well built up during past years, an occasional cultivation following the early spring breaking will keep recovery growth of the cores checked and will release enough plant food to carry the trees up to the "June" drop.

If terminal growth up to this time has been rapid and shows no sign of slowing up and if the crop is not excessive, it is possible that additional fertilizer nitrogen will not be needed. However, in most orchards a ring application of two to three pounds of nitrate of soda should be made in June to secure the amount of terminal growth desired and to set a full crop of fruit.

Cultivation should be stopped in early July or later in very dry seasons. If the soil will produce a good volunteer cover of weeds and grasses, save the cost of cover crop seeding. For the next year and probably longer we must put the emphasis on tree growth and not on the growth of the soil cover. The supply of cover crop seeds for 1942 is uncertain. If you think it necessary to seed a cover, study prices before you buy.

A supply of phosphorus and potassium in the soil is necessary for a good growth of weeds or a seeded cover. If you have used superphosphate and potash regularly, you can safely omit these for a year or at least cut down the rate used. If your soil is deficient in these two elements, use enough superphosphate and potash to meet the fixing power of your soil and leave a reserve for the cover growth. This will mean a broadcast application at the last cultivation or at seeding of from 150 to 300 pounds of superphosphate and from 50 to 100 pounds of potash per acre. If a few pounds of a nitrogenous fertilizer can be added to the mixture, the cover growth will be stimulated.

Spraying. The spray program should be selected with special care to avoid spray burn-

ing. A full crop of good sized fruit can not be made by a tree with damaged leaves, no matter how rich the soil is. The usual programs may have to be modified according to the availability of the various spray materials. Consult your County Agricultural Extension Agent.

Harvesting. Picking labor will be scarce. The county fruit associations should arrange with the county school superintendent or the village school board for vacations for the older boys and girls at harvest time.

If storage space is available and the fruit does not have to be washed to remove spray residue, the entire crew can be used for picking when the weather permits. Put the fruit, orchard run, into the storage during the cool hours of early morning.

Culls. The nation needs more marketable fruit, not more culls. Study your cull pile to find out why you have culls. Even in a year of serious labor scarcity, thinning cannot be neglected if the trees have set a heavy crop. Start early. The boys and girls can help.

Peaches

In the apple, most of the fruit buds for next year's crop are initiated within six weeks after petal fall on spurs growing on branches two years old or older. In the peach, fruit buds for next year's crop are formed on branches which are growing this summer. At pruning time, a terminal branch of 12 to 15 inches which grew the previous summer should have two or three buds at each node through the middle half. At each node one bud is a foliage but the others are fruit buds. In the apple, terminal growth may be checked by late July without detriment to next year's crop. In the peach, terminal growth should continue nearly to harvest time. In the younger trees it is desirable for the main terminal to have some secondary branching and this does not take place unless growing conditions are favorable in midsummer.

To insure this longer growing period in the peach requires a more sustained supply of available soil nitrogen than is necessary or even desirable in the apple orchard. Unfortunately, peach orchard soil cultivation has been far more intense than in the apple orchard, and in most orchards reserves of soil organic matter are too low to be depended on as a source of additional nitrogen. To a very large extent we must continue to meet the nitrogen needs of our peach orchards with commercial fertilizers.

Soil Management. Only within recent years have peach growers recognized that the usual clean cultivation continued for two months or more each year has burned out the soil organic supply and has so destroyed the physical condition of the soil that the surface is no longer sufficiently permeable to keep summer storms from causing severe erosion, with serious loss of soil and water.

Recognizing the seriousness of this situation, some growers have begun to build up their soil by a sharp decrease in cultivation and a much longer time to grow a heavy soil cover. This program has usually required an extra summer application of commercial nitrogen to keep terminal growth continuing at a time when the heavier soil covers are using increasing quantities of soil nitrogen. If supplies of commercial nitrogen are too restricted, these plans for soil building may have to be modified by at least a partial return to early summer cultivation.

If a legume cover such as vetch or crimson clover is growing over the winter in the peach orchard, spring cultivation can be delayed until early June. In years of normal rainfall such a cover can be reseeded with a shade crop of millet in early July after one or two additional cultivations have fitted the land.

A non-legume cover, such as rye grass, should be worked down earlier. If this is not done, the increased use of soil nitrogen, both for the growth of the heavier cover and for the rotting of the more strawey residues, will check tree growth unless additional amounts of commercial nitrogen are used.

A ring application of one and one-half to two pounds of nitrate of soda, or its equivalent, should be made just before bloom and a second ring application made in early summer. Phosphate and potash should be used at the time the cover crop is seeded, as suggested for the apple orchard. Because peach orchard soils are deficient in humus, it is desirable to use a seeded cover rather than to trust to a volunteer growth of weeds.

Mulches

A mulch of four to five tons of straw to the acre will increase the efficiency of any phosphate and potash fertilizers used, will improve the surface permeability of the soil, and so add to the water available to the trees; also, such a mulch will do away with the necessity of cultivation. Old straw, spoiled hay, weeds, or any other available trash can be used for mulching. Any low spots on the farm too wet for cropping should be seeded to strong-growing grasses to supply mulch material. During the rotting of straw, nitrogen is withdrawn

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Principal Articles in This Issue

Vitamins as Fertilizers

In a circular issued by the Texas Agricultural Experiment Station, entitled "Vitamin B_1 (Thiamin) and Other Vitamins as Fertilizers," G. S. Fraps and J. F. Fudge, of the Division of Chemistry, reports the results of scientific tests of the new vitamin preparations which have been placed on the market in recent months. In summarizing the investigation, the authors state:

"Claims by those interested in selling them that vitamin B_1 (thiamin) or other vitamins when applied to plants will produce surprising results on flowers or growth of the plants are not justified by the tests made by scientific investigators.

"In work done at College Station, vitamin B_1 produced a slight increase in the size of zinnia blooms, some increase in the size of pansy plants and the number of pansy flowers, but no favorable effect upon snapdragons, begonia, cineraria, alternanthera, and Asparagus plumosus.

"Other workers have found that applications of vitamin B_1 made no difference in the growth of roots or shoots of tomatoes, lettuce, cosmos, mustard, cocklebur, zinnia, radish, cabbage, dahlia, sunflower, orange trees, wheat, asters and others. Heavy yields of vegetables and large productions of flowers have been obtained from plants grown in water culture without addition of vitamin B_1 or other vitamins.

"The evidence available from this laboratory and from other investigations shows that vitamin B_1 may aid some plants to overcome shock at the time of transplanting by stimulating the growth of roots. It may aid in the growth of some naturally slow growing plants. It has little or no effect upon most flowering plants, vegetables, grass and trees. There are at present no indications that other vitamins are beneficial when applied to such plants.

"Application of vitamin B_1 to soils in the growing of plants has probably a restricted field of usefulness, at the time of transplanting or for slow growing plants, but the majority of plants produce in their leaves sufficient supplies of vitamins for their own use and others secure it from the soil in sufficient quantity."

The Best Fertilizer for Victory—Defense Bonds.

JANUARY SULPHATE OF AMMONIA

The production of by-product sulphate of ammonia and ammonia liquor during January continued at the high levels which have now become standard, according to the figures of the U. S. Bureau of Mines. Sulphate production during January totaled 65,548 tons, a decrease of 72 tons from the December figures and an increase of 79 tons over January, 1941. However, shipments during January showed a distinct increase of 10 per cent over December, with a result that stocks on hand at the end of the month had decreased to 21,585 tons, a supply which was equivalent to only about 10 days' production.

	Sulphate of Ammonia Tons	Ammonia Liquor NH_3 Content Tons
Production:		
January, 1942	65,548	2,904
December, 1941	65,620	2,809
January, 1941	64,669	2,663
Shipments:		
January, 1942	74,955	3,056
December, 1941	67,578	3,099
January, 1941	61,586	3,274
Stocks on hand:		
January 31, 1942	21,585	896
December 31, 1942	31,094	756
January 31, 1941	47,529	947
December 31, 1940	44,542	1,266

Maryland Fertilizers

The sale of fertilizers in Maryland during 1941 showed an increase of 11,626 tons over 1940. Total sales amounted to 171,941 tons, but this figure is still under the record output of 186,285 tons in 1937.

Sales of mixed fertilizers accounted for 142,279, compared with 132,467 tons in 1940. As in previous years, the largest sales were in the higher analyses, only 560 tons containing less than 16 units of plant food. The 2-12-6 mixture continued to increase in popularity, with sales of 28,129 tons, followed by the 2-9-5 grade with 19,679 tons. The 18 analyses recommended by the Maryland Agricultural Experiment Station accounted for 68 per cent of mixed fertilizer sales, as compared with 59 per cent in 1940 and 46 per cent in 1939.

In the sales of individual materials for direct application or home mixing, superphosphate with 14,616 tons and nitrate of soda with 5,851 tons were the only materials used in any great quantity. Others were cyanamid, 931 tons; potash salts, 708 tons; bone meal, 648 tons; rock phosphate, 547 tons.

Analyses registered during the year increased from 107 in 1940 to 128 in 1941. Of the 92 mixtures, however, only 21 had sales of over 1,000 tons each, while 36 sold less than 100 tons each.

	1941	1940
Firms registered	106	101
Brands registered	956	886
Analyses registered	128	107
Complete fertilizers registered	81	74
Superphosphate and potash mixtures registered	11	9

	1941 Tons	1940 Tons
Total sales	171,941	160,315
Sales by out-of-state firms	15,984	15,736
Complete fertilizers	131,470	121,089
Superphosphate and potash mixtures	10,809	11,378
Nitrogen salts	6,928	7,153
Superphosphate	14,616	11,545
Potash salts	708	642
Nitrogen in mixed fertilizers	4,411	3,947
Phosphoric acid in mixed fertilizers	16,648	12,893
Potash in mixed fertilizers	10,266	9,296

Brands Showing Largest Tonnage, 1941

Analysis	Units of Plant Food	1941 Tons	1940 Tons
2-12-6	20	28,129	23,432
2-9-5	16	19,679	22,474
0-20-0	20	12,024	7,318
3-12-6	21	11,414	8,919
2-8-10	20	9,668	9,096
6-6-5	17	8,899	10,100
4-8-8	20	6,799	6,405
4-8-12	24	6,777	5,638
Nitrate of Soda		5,851	5,533
6-8-6	20	5,756	4,246
4-8-10	22	5,437	5,339
0-14-6	20	3,680	3,517
5-8-12	25	3,616	3,415
0-10-10	20	3,452	3,469

Recommended Fertilizer Analyses for 1941
(By Maryland Agricultural Experiment Station)

Analysis	Units of Plant Food	1941 Tons	1940 Tons
2-12-6	20	28,129	23,432
0-20-0	20	12,025	7,318
3-12-6	21	11,414	8,842
2-8-10	20	9,174	9,100
4-8-8	20	6,799	6,405
6-8-6	22	5,757	4,246
5-8-12	25	3,616	3,241
0-14-6	20	3,681	3,517
3-8-15	26	2,953	1,667
5-10-5	20	2,729	1,757
0-12-12	24	1,432	1,173
4-12-4	20	1,061	788
10-6-4	20	550	398
4-16-4	24	151	183
*2-8-10	20	494	565
*4-8-12	24	6,653	5,539
*6-6-8	20	322	248
*2-12-8	22	69	101
		97,009	78,520

* Special fertilizer analyses for tobacco (potash derived from sulphate of potash).

February Tag Sales

Further evidence that farmers are cooperating in the war effort by buying their fertilizer early, in order to help prevent a congestion in transportation facilities later in the season, is furnished by the February record of fertilizer tax tag sales.

Aggregate sales in the 17 reporting States were a fourth larger than in February, 1941. This followed an even sharper rise in January. Usually, sales in February are substantially larger than in January. Another sharp increase normally takes place in March, which marks the seasonal peak in most years, with sales in the month accounting for about a third of the annual total. The usual seasonal movement is quite distorted this year, however, by the effect of the early buying.

Total sales in January and February combined amounted to 2,274,000 tons, an increase of 62 per cent over the corresponding period of 1941 and nearly double the sales in the first two months of 1940. While the demand for fertilizer, under the stimulus of the food-for-victory program, a large farm income and extremely favorable price relationships, is probably at an all-time high this year, it is nevertheless true that the sharp rise in tag sales to date reflects the early buying program rather than the increased demand for fertilizer.

FERTILIZER TAX TAG SALES

State	February				January-February			
	1942		1941	1940	1942		1941	1940
	Per Cent of 1941	Tons	Tons	Tons	Per Cent of 1941	Tons	Tons	Tons
Virginia	98	63,470	64,519	54,161	161	156,518	97,169	88,234
N. Carolina	183	267,898	146,582	159,531	247	628,856	254,130	242,214
S. Carolina	174	208,552	119,936	100,970	194	329,725	170,038	146,115
Georgia	57	71,563	124,820	130,780	89	150,812	169,902	159,267
Florida	99	68,560	69,294	47,155	107	160,717	150,388	122,351
Alabama	180	147,700	82,000	80,200	203	253,050	124,900	113,800
Mississippi	93	64,965	69,689	32,888	104	138,915	132,939	87,338
Tennessee	128	28,040	21,950	16,126	147	43,579	29,608	16,226
Arkansas	175	32,350	18,450	11,150	149	70,250	47,000	30,200
Louisiana	136	30,197	22,150	22,336	92	55,947	61,100	44,486
Texas	88	19,955	22,620	19,768	104	44,580	42,980	33,561
Oklahoma	91	2,900	3,186	1,191	62	3,550	5,686	2,853
Total South	131	1,006,150	765,196	676,256	158	2,036,499	1,285,840	1,086,645
Indiana	80	50,004	62,847	16,669	209	147,568	70,608	58,794
Illinois	212	6,825	3,225	4,263	535	22,190	4,148	5,343
Kentucky	115	22,158	19,313	14,875	153	38,781	25,401	17,325
Missouri	51	3,496	6,797	5,189	204	28,203	13,813	7,218
Kansas	33	290	877	500	7	305	4,217	1,450
Total Midwest	89	82,773	93,059	41,496	201	237,047	118,187	90,130
Grand Total	127	1,088,923	858,255	717,752	162	2,273,546	1,404,027	1,176,775

FERTILIZER MATERIALS MARKET

NEW YORK

Nitrate of Soda Allotments Released by War Production Board. Deliveries Lag in Some Chemical Materials. Organic Material Prices Firm.

Exclusive Correspondence to "The American Fertilizer."

NEW YORK, March 10, 1942.

The War Production Board released certain individual allocated lots of nitrate of soda during the past week and small shipments have accordingly been made to fertilizer manufacturers in the north. Up to now, from all indications, only small deliveries have been permitted and there is no indication as to what will be released during the month.

The situation in other fertilizer materials remains unchanged with probably a tightening in sulphate of ammonia, potash and superphosphate.

On these commodities, producers are considerably behind in deliveries against contract obligations, with no indication that there will be any possibility of catching up before May or June.

Lack of sufficient sulphuric acid is in many cases curtailing the productions of all grades of superphosphate and it is especially reflected in the high-test material.

Nitrogenous in most parts of the country was not available except for delivery against contracts previously made.

Dried blood: due to difficulty in obtaining freight space, practically no South American material is being offered and domestic material is very firm.

BALTIMORE

Early Spring Season Indicated. Nitrate of Soda Allocations Released. No Increase as yet in Superphosphate Prices.

Exclusive Correspondence to "The American Fertilizer"

BALTIMORE, March 10, 1942.

There have not been any outstanding features in connection with the market on fertilizer materials during the past few weeks. On account of mild weather, indications are for an early spring season and manufacturers are now busy preparing for same.

Ammoniates.—There is nothing particularly new in the market, as ground animal tankage is still ruling too high for fertilizer purposes. The nominal market is $6.60 per unit of nitrogen and 10 cents per unit of B.P.L., f.o.b. northern producing points.

Nitrogenous Material.—The market on this continues firm in sympathy with the higher market prevailing on organics, and is nominally $4.00 per unit of nitrogen, f.o.b. Baltimore.

Sulphate of Ammonia.—There is nothing new in the situation but there are no re-sale offerings on the market. Manufacturers are conserving their supplies in the hope they will have sufficient to see them through the current season.

Nitrate of Soda.—Allocations for the month of March for distribution to Maryland consumers is comparatively light and based more or less on last year's deliveries. None of the manufacturers, however, have been able to get anything like the normal tonnage they expected earlier in the season. Importers of the Chilean material continue to quote $30.00 per ton in bulk; $33.00 in 100-lb. bags and $32.40 per ton in 200-lb. bags, ex port warehouse, on such tonnage as is relased by the OPM.

Fish Meal.—There is no change in the market and ceiling price of $72.50 for 60 per cent grade f.o.b. Baltimore still prevails.

Superphosphate.—With the withdrawal of all coast-wise shipping, manufacturers are now taking deliveries of phosphate rock by rail at added freight expense and unloading cost, but up to the present time have not made any change in price which still remains at 60 cents per unit for run-of-pile, basis 16 per cent, and $10.10 per ton of 2,000 lb., for flat 16 per cent grade, both in bulk, f.o.b. Baltimore.

Bone Meal.—The market continues quiet with practically no interest being shown. On the other hand, there are no offerings pressing on the market.

Potash.—Producers continue to ship against current contracts and, as far as can be learned,

no surplus has been accumulated by any of the manufacturers, who hope to get through the season without any critical shortage.

Bags.—There is no change in the bag situation since last report, except that second-hand bags are practically unobtainable, while new bags are only to be had in accordance with OPM regulations.

TENNESSEE PHOSPHATE

Late Spring Hinders Farming and Mining Operations. Heavier Rock Shipments Noted. New Defense Plants Rumored.

Exclusive Correspondence to "The American Fertilizer."

COLUMBIA, TENN., March 9, 1942.

It has certainly been a backward spring and the past two weeks, with heavy freezes and some snow, have made some sojourners from above the line wonder where the sunny south comes in, to say nothing of the lament of the farmer behind in his spring plowing and other work, and the phosphate operator engaged in outdoor construction work and mining.

Shipments of phosphate rock to all consuming channels have continued heavier in December, January, February and so far in March than ever known before, while at least three large orders seeking placement have been turned down as immediately unobtainable.

Ground rock to farmers for direct application moved in December, 1941, to March 1, 1942, was 183 per cent of the two previous years for the same period and 295 per cent of the period December, 1938/March 1, 1939. Many still believe that the more ground rock is used by farmers the more commercial fertilizers will be sold, because ground rock builds good soils and really profitable response from commercial fertilizers comes on good soils and not on poor soils.

Local press reports have given several statements and unofficial announcements of one or two large defense plants to be built in this area with the popular figure of $5,000,000 to be spent. One report which has not been publicly made, but privately intimated, has it that one of the large consumers of phosphate rock now purchasing from the Tennessee field will soon install its own plant for production of rock in this area, which may enable more of the existing production to be turned into the channel of farmer consumption for direct application.

The 50 per cent increase of grinding capacity being installed by Hoover & Mason Phosphate Co., to take care of the large amount of unfilled orders of the Ruhm Phosphate & Chemical Co., including heavy orders from the AAA, is nearing completion and, with use of temporary motors, will doubtless be in at least partial operation within the month of March.

CHARLESTON

Very Heavy Shipments of Mixed Goods to Date. Organic Materials are Scarce or even Unobtainable.

Exclusive Correspondence to "The American Fertilizer."

CHARLESTON, March 9, 1942.

The heavy movement of mixed goods continues and total shipped so far this season is very, very far ahead of the same date last season.

Nitrogenous.—Supplies of this continue to get more and more scarce. The market is around $3.25 per unit of ammonia ($3.95 per unit N), f.o.b. western points; $3.60 per unit of ammonia ($4.37½ per unit N), ex vessel southern ports, prompt only, if any left.

Blood.—This material is quoted around $5.25 per unit ammonia ($6.38 per unit N), f.o.b. ports for imported material, but this is very scarce. The Chicago market is $5.50 per unit ammonia ($6.68½ per unit N).

Fish Meal.—This material is unobtainable.

Cottonseed Meal.—The 8 per cent grade is quoted in Memphis at $36.88 per ton; in Atlanta at $43.00.

Superphosphate.—No offerings are on the market.

CHICAGO

Scarcity of Fertilizer Organics Restricts Trading. Quotations Largely Nominal. Lack of Feed Material Offerings.

Exclusive Correspondence to "The American Fertilizer."

CHICAGO, March 9, 1942.

The middle-west ammoniate markets continue steady-toned but few sales are reported; trading is restricted, owing to small offerings. Efforts are being now made to ship as much as possible on old contracts before the general freight rates are advanced March 18th. While the nominal market on ground fertilizer tankage is quoted, there are no offerings of that material on the market at this time.

Business in the feed markets is hampered by lack of offerings of materials. The finished feed in some sections is moving steadily at ceiling prices.

Nominal prices are as follows: High-grade ground fertilizer tankage, $4.00 to $4.25 ($4.86 to $5.16½ per unit N) and 10 cents; standard grades crushed feeding tankage, $5.75 to $5.80 ($6.99 to $7.05 per unit N) and 10 cents; blood, $5.65 to $5.75 ($6.87 to $6.99 per unit N); dry rendered tankage, $1.25 to $1.30 per unit of protein, Chicago basis.

CHANGES IN U. S. D. A.

Major changes in the administration of the U. S. Department of Agriculture were announced on February 26th to implement and strengthen the wartime reorganization of the Department announced on December 13, 1941, by Secretary Wickard. Roy F. Hendrickson, as administrator of the Agricultural Marketing Administration, will have C. W. Kitchen and E. W. Gaumnitz as associate administrators, and Fred V. Waugh and Ralph W. Olmstead as assistant administrators. The change will bring the activities and functions of the Surplus Marketing Administration, the Federal Surplus Commodities Corporation, the Agricultural Marketing Service, and the Commodity Exchange Administration into a single agency.

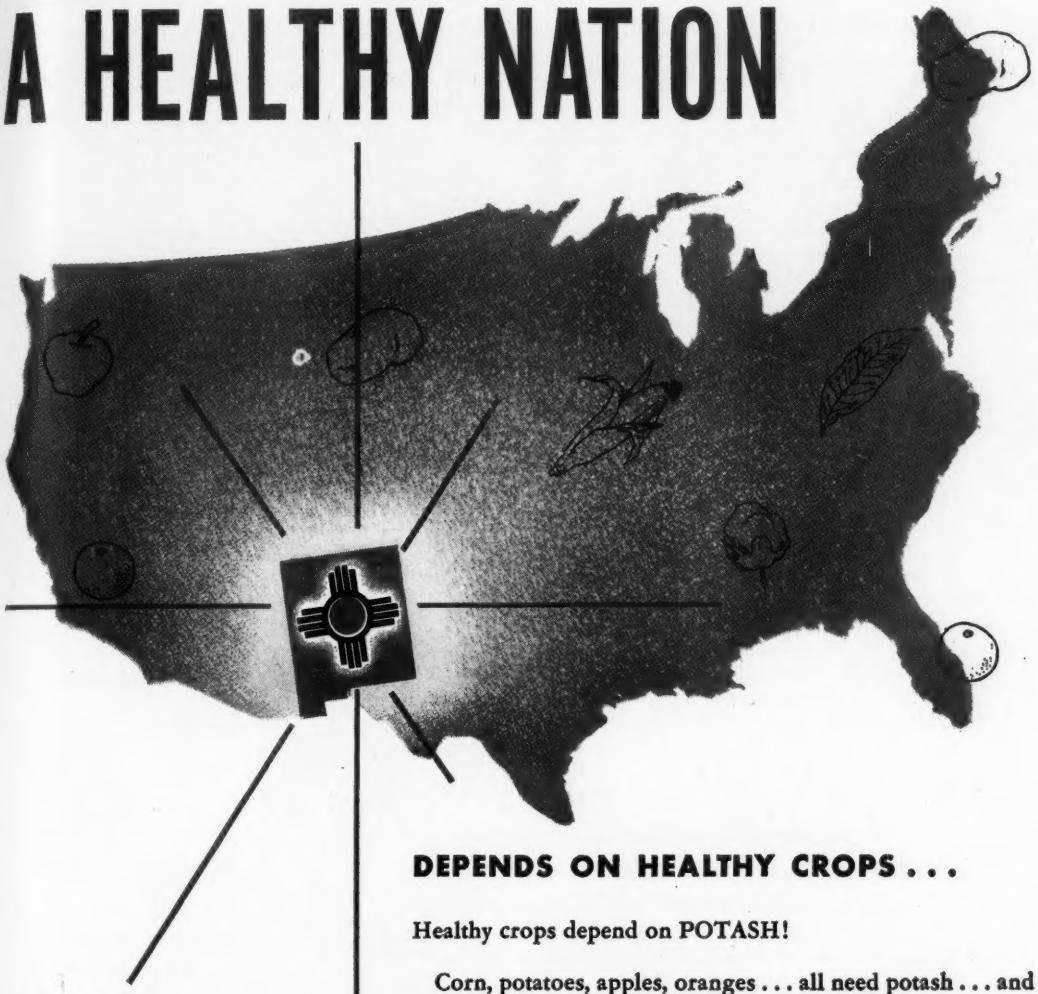
RECORD YEAR FOR TEXAS GULF SULPHUR COMPANY

According to the Bureau of Mines, production of crude sulphur in the United States in 1941 attained a new record of 3,139,253 long tons, a 15 per cent gain over 1940. Mine shipments increased about one-third and were the largest on record—3,401,410 long tons, compared with 2,558,742 tons in 1940.

With reference to the operations of the Texas Gulf Sulphur Company during 1941, Walter H. Aldridge, President, in his Annual Report says:

"Notwithstanding shipments of more than 2,000,000 tons of sulphur during, 1941, the largest in the history of the Company, the stocks of sulphur above ground at the mines today are at virtually the same tonnage as a year ago. Total stocks of the Company at all points, including the mines, remain in excess of 3,000,000 tons, and exceed by about 5 per cent the corresponding figure at the beginning of 1941. The Texas Gulf Sulphur Company is prepared to produce sulphur at a materially higher rate than that of 1941, if the demand should make such an increase necessary."

A HEALTHY NATION



DEPENDS ON HEALTHY CROPS . . .

Healthy crops depend on POTASH!

Corn, potatoes, apples, oranges . . . all need potash . . . and without it do not mature properly. Enough potash for corn assures the farmer of full ears of high feed value . . . prevents firing of the leaves and lodging. The potato plant, amply fed on potash, more easily resists pests, disease and drought . . . gives the grower more "No. 1's" per acre. Fruit trees also thrive when fertilized with a mix that includes the right proportion of potash. This vital plant food imparts vigor to the trees . . . improves the keeping quality of the fruit.

SUNSHINE STATE POTASH, mined in New Mexico, can be depended upon by fertilizer manufacturers because of its uniform analysis and careful sizing which makes blending easy.

HIGRADE MURIATE OF POTASH
62/63% K_2O
Also 50% K_2O Grade
MANURE SALTS
22% K_2O Minimum
Trademark Reg. U. S. Pat. Off.

SUNSHINE STATE POTASH
A PRODUCT OF NEW MEXICO U.S.A.

UNITED STATES POTASH COMPANY, *Incorporated*, 30 ROCKEFELLER PLAZA, NEW YORK

TIRES FOR FERTILIZER HAULING

Inquiries made by the National Fertilizer Association would indicate that trucks used in transporting fertilizers would be eligible for new tires when replacements were needed. An OPA official expressed an oral opinion that use of a truck by a fertilizer manufacturer to transport fertilizer to his farmer-purchasers does not render ineligible for new tires a truck which is otherwise eligible. Such transportation of fertilizer is not considered as transportation "of commodities to the ultimate consumer for personal, family, or household use" but as transportation of materials to be used in production of other goods.

As regards farmers' trucks, an OPA official was also of the opinion that a farmer's truck owned by him and used exclusively for "general farm work," including such work as hauling farm produce (tobacco, cotton, etc.) to market, hauling feed to the farm for cattle, swine, poultry, etc., and for hauling fertilizers from the factory or warehouse to the farm, is eligible for new tires. It appears also that incidental use of such a truck by the farmer to carry home a loaf of bread or a pound of sugar, for example, upon a return trip from transporting his produce to market, would not make the truck ineligible.

"Your D---d Fertilizer Caused My Crop Failure"

By V. Sauchelli, Director of Sales Research, Davison Chemical Corporation, Baltimore.

Every salesman has had an experience with some dissatisfied farmer who claimed that his crop failure was due to poor fertilizer. Rightly or wrongly, such a farmer believes that fertilizer is the major factor in bringing the crop to a successful harvest. He may have been led to such belief by the type of sales talk given him by the fertilizer agent or the salesman himself. Most salesmen, we know, are careful when presenting their arguments on behalf of the special fertilizer they sell, not to "oversell" the farmer on the fertilizer. It can happen, however, that unknowingly the salesman may overstress the importance of fertilizer in crop production and thereby lead the farmer to believe that all he needs to get "that big crop," come harvest time, is to apply the fertilizer under question.

Most farmers, generally speaking, are not too well instructed in all the factors involved in crop production. Too many of them operate according to rule-of-thumb methods. They do what they do because neighbor Jones does it or because his father did it. Crop production, however, is the result of the interplay of a large number of factors, each one of which can, under certain conditions, become a limiting factor. The following outline lists the most important factors and is presented primarily as a review for the salesman, so that he will be able to discuss a farmer's claim of crop failure more intelligently, especially when the farmer may allege that the salesman's brand of fertilizer was solely responsible for the failure to produce a good harvest.

In addition to nitrogen, phosphoric acid and potash (the three important plant food elements of any fertilizer), the following factors are capable if limiting soil productivity and therefore condition the growth and yield of a crop:

1. Insufficient calcium.
2. Insufficient magnesium.
3. Absence of desirable bacteria and fungi.
4. Lack of aeration.
5. Impervious subsoil.
6. Low water intake.
7. Low water holding capacity
8. Low organic matter.
9. Low availability of minor elements: boron, copper, manganese, zinc.
10. Quality of seed.
11. Land preparation.
12. Insects.
13. Diseases.
14. Rainfall.
15. Drainage.
16. Erosion.
17. Depth of soil.
18. Humidity.
19. Light.
20. Temperature.
21. Placement of fertilizer.

Brief references to some of these items may

(Continued on page 26)

Sulphur Production in 1941

Production of crude sulphur in the United States in 1941 attained a new record of 3,139,253 long tons, a 15 per cent gain over the 1940 output of 2,732,088 tons, according to the Bureau of Mines, United States Department of the Interior. Mine shipments increased by one-third and were also the largest on record—3,401,410 long tons valued at $54,400,000 in 1941 compared with 2,558,742 tons valued at $40,900,000 in 1940. Stocks of sulphur at the mines decreased from 4,200,000 long tons at the beginning of 1941 to a year-end quantity of 3,900,000 tons, which is still more than a year's supply at the current rate of consumption. Production of sulphur was reported from California, Louisiana, and Texas.

Texas increased its production 17 per cent to 2,596,731 long tons in 1941 from 2,212,839 tons in 1940. Mine shipments were 2,842,988 tons in 1941 compared with 2,008,968 tons in 1940. The properties that contributed to the Texas production in 1941 were those of Duval Texas Sulphur Co. at Orchard Dome, Fort Bend County, and at Boling Dome, Boling, Wharton County; Freeport Sulphur Co. at Hoskins Mound, Brazoria County; Jefferson Lake Sulphur Co., Inc., at Clemens Dome, Brazoria County; and Texas Gulf Sulphur Co. at Boling Dome, Newgulf, Wharton County.

Louisiana produced 533,620 long tons of sulphur in 1941 compared with 512,935 long tons in 1940, a gain of 4 per cent. Shipments were 549,619 tons in 1941 and 543,004 tons in 1940. For the fifth successive year the total sulphur output of Louisian was mined by the Freeport Sulphur Co. at Grande Ecaille, Port Sulphur, Plaquemines Parish.

Production of sulphur in California was 8,902 long tons in 1941 compared with a total of 6,314 tons in both California and Utah in 1940. The Bureau of Mines was not at liberty to publish figures for California and Utah separately in 1940. Two operators, Paul Barnes and Pacific Sulphur Co., at Big Pine, Inyo County, furnished the California output. No sulphur was produced in Utah in 1941.

Exports of crude sulphur from the United States were 474,551 long tons valued at $8,098,958 in the first nine months of 1941 compared with 746,468 tons valued at $13,041,911 in all of 1940, according to the Bureau of the Census. Exports of refined sulphur were 55,289,420 pounds valued at $994,390 in the first nine months of 1941 and 44,229,114 pounds valued at $780,968 in the full year of 1940.

Imports of sulphur by the United States were 20 954 long tons valued at $355,359 in the first nine months of 1941 compared with 27,845 tons valued at $473,052 in all of 1940. Of the partial 1941 receipts, 20,937 tons was from Canada, 16 tons from the United Kingdom, and 1 ton from Japan. The Canadian material is elemental sulphur recovered from smelter gases. No sulphur ore was imported by the United States in the first nine months of 1941.

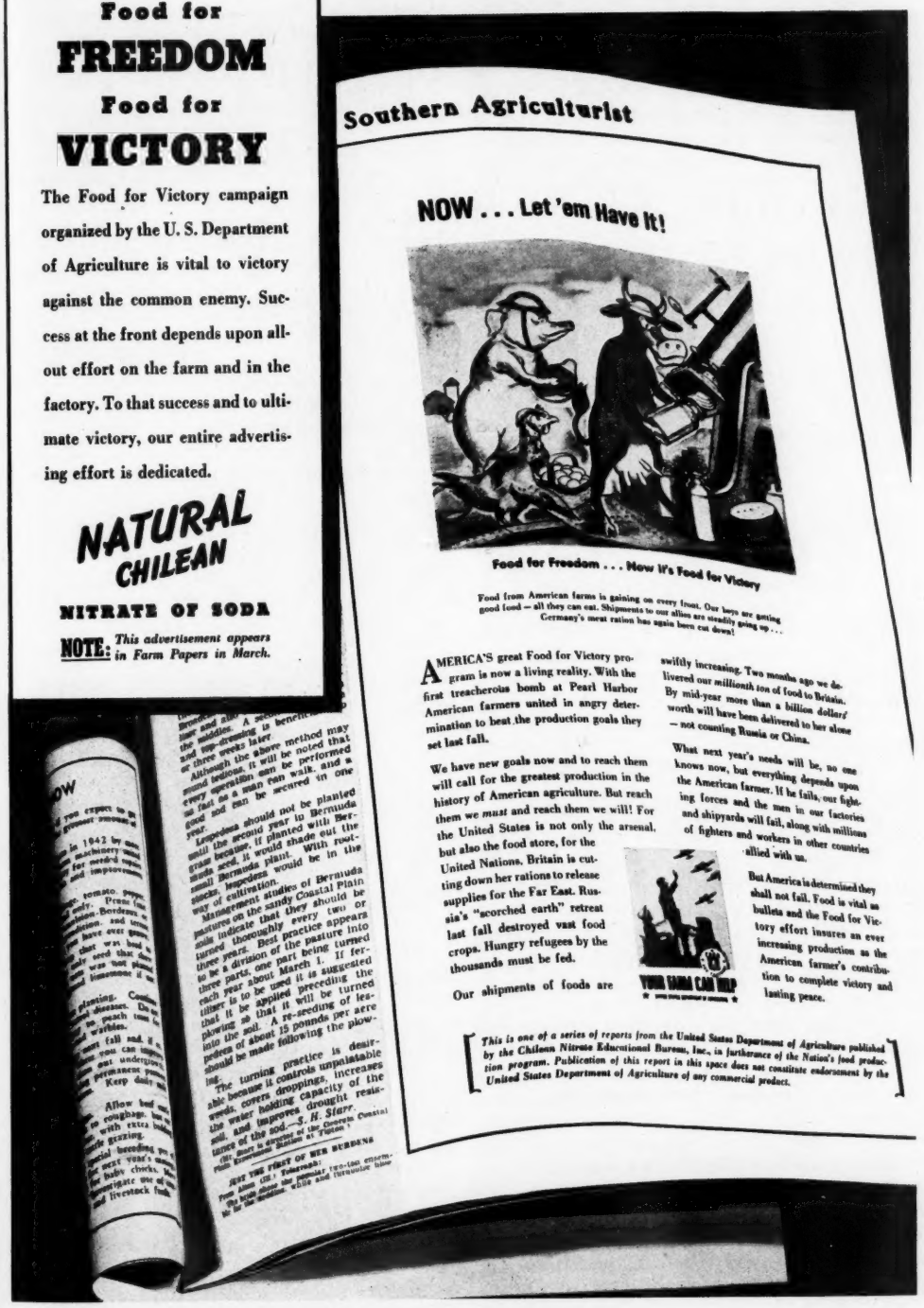
The price of crude sulphur held to the level of recent years and was quoted by the trade journals throughout 1941 at $16 a long ton, f.o.b. mines.

CLASSIFIED ADVERTISEMENTS

Advertisements for sale of plants, machinery, etc., and for help and employment, in this column, same type as now used, 60 cents per line, each insertion.

WANTED

WANTED—A tank car for handling Sulphuric Acid or an 8,000 gallon tank that can be placed upon trucks already owned by advertiser. Address "535," care THE AMERICAN FERTILIZER, Philadelphia.



Southern Agriculturist

NOW . . . Let 'em Have It!

Food for Freedom . . . How it's Food for Victory

Food from American farms is gaining on every front. Our boys are getting good food — all they can eat. Shipments to our allies are steadily going up . . . Germany's meat ration has again been cut down!

AMERICA'S great Food for Victory program is now a living reality. With the first treacherous bomb at Pearl Harbor American farmers united in angry determination to beat the production goals they set last fall.

We have new goals now and to reach them will call for the greatest production in the history of American agriculture. But reach them we *must* and reach them we will! For the United States is not only the arsenal, but also the food store, for the United Nations. Britain is cutting down her rations to release supplies for the Far East. Russia's "scorched earth" retreat last fall destroyed vast food crops. Hungry refugees by the thousands must be fed.

Our shipments of foods are swiftly increasing. Two months ago we delivered our *millionth* ton of food to Britain. By mid-year more than a billion dollars' worth will have been delivered to her alone — not counting Russia or China.

What next year's needs will be, no one knows now, but everything depends upon the American farmer. If he fails, our fighting forces and the men in our factories and shipyards will fail, along with millions of fighters and workers in other countries allied with us.

But America is determined they shall not fail. Food is vital as bullets and the Food for Victory effort insures an ever increasing production as the American farmer's contribution to complete victory and lasting peace.

This is one of a series of reports from the **United States Department of Agriculture** *published by the* **Chilean Nitrate Educational Bureau, Inc.,** *in furtherance of the Nation's food production program. Publication of this report in this space does not constitute endorsement by the* **United States Department of Agriculture** *of any commercial product.*

March Crop Report

Prospects for winter and early spring vegetables in the South and California continue generally favorable. Acreages are being well maintained or increased and good yields per acre are expected. The crop of early cabbage is expected to be exceptionally large, current reports indicating about 840 million pounds, which would be more than 6 pounds per capita for the entire population. The acreage in early tomatoes is about a third larger than that harvested last year.

Citrus fruits suffered locally from high winds in Florida and from cold weather in California but losses do not appear to have been serious except for a reduction of 10 per cent in prospects for lemons. The total orange and grapefruit crops are expected to be nearly equal to the large crops of last season.

Total orange production for the 1941-42 marketing season is now placed at 83,914,000 boxes, compared with 84,082,000 boxes produced last season (1940-41), and 75,667,000 boxes in 1939-40.

Production of early and midseason oranges in Florida (exclusive of tangerines) is placed at 15,400,000 boxes. Production of these varieties in 1940-41 was 15,900,000 boxes. The Florida tangerine crop for 1941-42 totaled 2,100,000 boxes compared with the 1940-41 crop of 2,700,000 boxes. The Florida Valencia orange crop for harvest during the coming spring and summer is indicated to be 12,700,000 boxes—slightly larger than the 1940-41 production of 12,500,000 boxes of this variety. February weather in Florida was relatively favorable for citrus fruits. Light frosts occurred on a number of occasions but citrus crops were not damaged. For a few days beginning with March 1st, high winds, which were prevalent in some areas during that time, "whipped" trees rather violently and blew off some fruit—mostly early and midseason oranges, and seeded varieties of grapefruit. Losses from this cause were not extensive, however.

The California crop of navel and miscellaneous varieties of oranges is estimated at 20,496,000 boxes, compared with last season's production (1940-41) of 19,472,000 boxes. California Valencia production is indicated to be 29,520,000 boxes, compared with 1940-41 Valencia crop of 30,006,000 boxes in that State. Freezing temperatures prevailed in some California citrus areas on several occasions during February, with considerable damage occurring on the nights of the fourteenth and fifteenth in southern California—chiefly in San Bernardino, Riverside, and eastern Los Angeles Counties. These frosts, however, did not reduce the total crop of any citrus fruits except lemons, indicated production of which is down 10 per cent. Navels were damaged in some localities but all, or nearly all, frost-damaged fruit probably will be utilized for processing. No serious injury to Valencias is indicated at this time. A much needed rain occurred over citrus areas in southern California on February 21st, which, though not sufficiently prolonged to provide ample moisture for a long period of time, was extremely beneficial to both trees and fruit.

The Texas orange crop for the 1941-42 season is estimated at 2,900,000 boxes, compared with 2,750,000 boxes produced last season (1940-41). Arizona orange production is placed at 600,000 boxes, compared with last season's crop of 500,000 boxes.

The United States grapefruit crop is indicated to be 41,540,000 boxes. Production in 1940-41 totaled 43,033,000 boxes, and the 1939-40 production was 35,192,000 boxes. The Florida grapefruit crop is estimated at 21,400,000 boxes—13 per cent smaller than last season's (1940-41) production of 24,600,000 boxes in that State. High winds in some sections of the Florida citrus belt during February blew some "seeded" varieties of grapefruit from the trees, but losses were not serious for the State as a whole.

Texas grapefruit production for 1941-42 is placed at 15,100,000 boxes—9 per cent larger than the 1940-41 crop of 13,800,000 boxes. Ample rainfall occurred in Texas citrus areas during February, and trees are in excellent condition. Grapefruit production in Arizona is expected to total 3,000,000 boxes for the current marketing season. Last year's production in that State totaled 2,650,000 boxes. Though freezing temperatures prevailed on several occasions in Arizona citrus areas during February, frost damage to citrus has not been significant. The 1941-42 California grapefruit crop is estimated at 2,040,000 boxes—1,065,000 boxes in the Desert Valleys, and 975,000 boxes in other (summer-harvest) areas of the State. In 1940-41 production in that State totaled 1,983,000 boxes, with 960,000 boxes coming from Desert Valleys and 1,023,000 from other areas.

The California lemon crop for the 1941-42 season's harvest is now indicated to be 12,780,000 boxes. This indicated crop is 10 per cent less than was indicated on February 1st, due to losses from freezing temperatures on the nights of February 14-15 in the southern counties.

See Page 4

RATE OF NUTRIENT ABSORPTION BY POTATOES

(Continued from page 6)

bler variety, particularly more magnesium oxide. The magnesium oxide content of the tops and roots of the Cobbler variety was found to be considerably less than the content found in the other varieties, but comparatively little difference was found between varieties in the magnesium content of the tubers. The Cobbler variety absorbed only about 60 per cent as much magnesium oxide as did the later varieties in 1939.

The amount of nitrogen absorbed per acre by the four varieties of potatoes at 10-day in-

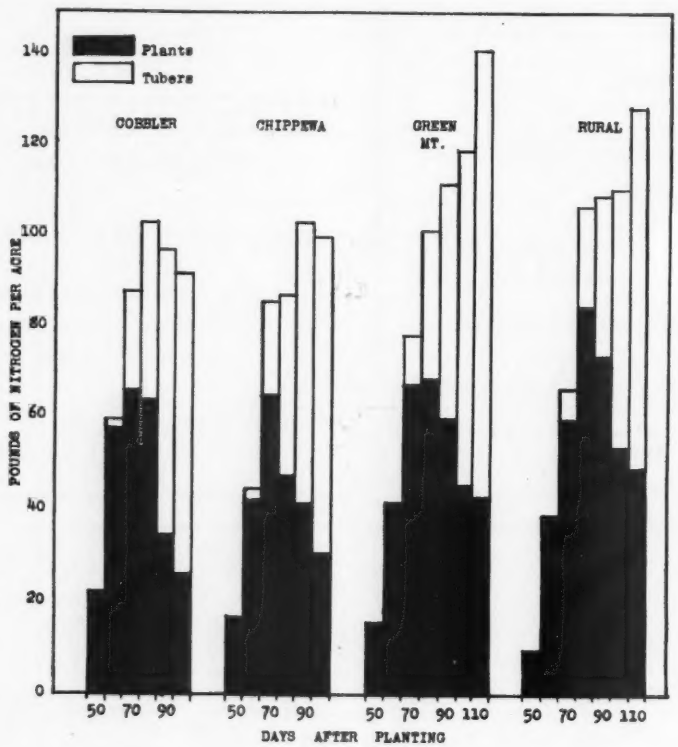


FIG. 1. Amount of nitrogen absorbed per acre by four varieties of potatoes at ten-day intervals (50 to 110 days after planting).

Table 3

Amount of Nitrogen Absorbed per Acre by Four Varieties of Potatoes During Successive Intervals of Growth, 1939*

Period of Growth Days	Nitrogen Absorbed per Acre During Each Period							
	Cobbler		Chippewa		Green Mountain		Rural #2	
	lbs.	%	lbs.	%	lbs.	%	lbs.	%
0-50	23.0	22.0	17.4	17.0	15.8	11.0	10.1	8.0
50-60	36.7	36.0	27.7	27.0	26.1	19.0	29.2	23.0
60-70	28.2	28.0	41.1	40.0	36.5	26.0	27.1	21.0
70-80	14.7	14.0	1.2	1.0	23.0	16.0	40.2	31.0
80-90	0.0	0.0	15.7	15.0	10.5	7.0	2.3	2.0
90-100	0.0	0.0	0.0		7.4†	5.0	1.7†	1.0
100-110	**		**		22.1††	16.0	17.9††	14.0
	102.6	100.0	103.1	100.0	141.4	100.0	128.5	100.0

* Arranged in order of maturity—early, intermediate, late, and very late—left to right respectively.

** Plants dead.

† Dry weather.

†† Plenty of moisture followed dry period.

tervals of growth are shown in Table 3 and Fig. 1.

The Cobbler variety absorbed 22 per cent of its nitrogen requirements under 1939 conditions by the fiftieth day as compared with eight per cent for the Rural variety. By the seventieth day, Cobblers had absorbed 86 per cent of the nitrogen absorbed during the season as compared to 52 per cent for the Rural and 56 per cent for the Green Mountain varieties.

MORE FRUIT FOR THE DURATION

(Continued from page 9)

from the soil by the micro-organisms acting on the straw. To prevent this temporary loss of soil nitrogen from checking tree growth, nitrogenous fertilizers must be used with the straw, the amount depending on the area covered by the straw. Two two-pound applications of nitrate of soda during the growing season will usually be sufficient.

If the trees are well spaced and not too large, a strip can be cultivated in each row along the slope and seeded to the regular cover. This will decrease the fire hazard which the presence of the dry straw creates.

WAR EMERGENCY CONFERENCES

(Continued from page 8)

Schaub spoke briefly on AAA goals; George W. McCarty of WPB answered questions relating to the allocation of nitrate of soda. In discussing the elimination of fillers and grade reduction, D. S. Coltrane, assistant to the Commissioner of Agriculture of North Carolina, stated that the number of grades sold in that State has now been limited by law and regulation to 36, and that only one of these grades contains less than 16 per cent of total plantfood.

The meeting was conducted informally, so that all during the day there was much discussion from the floor, many questions being asked and answered in so far as they can be answered under present circumstances. All who attended felt that the meeting had been very much worth while.

THAT D---D FERTILIZER

(Continued from page 18)

prove helpful to a better understanding of these factors.

Calcium and Magnesium. Liming soils increases the calcium and magnesium content; precipitates harmful quantities of aluminum, iron, and manganese out of the soil solution; increases the availability of phosphorus; stimulates the growth of beneficial micro-organisms; improves the physical qualities of the soil; and increases the amount of calcium and magnesium in the crop for human and animal consumption.

Aeration. Plants must have air in the soil to get full benefit from fertilizer. It is possible to increase the air capacity of soils by growing legume-grass mixtures in the rotation, by returning all plant residues to the soil, and by using liberal applications of manure.

Air provides oxygen. Desirable soil bacteria need oxygen for best development. A fertile soil is one which favors active bacterial growth —those tiny organisms in the soil which decompose organic matter and make available organic and mineral nutrients to every growing plant.

Poor Drainage. Under this heading are the following factors: impervious subsoil, low water intake, low water-holding capacity—each one of which may be closely interrelated with the others. Their interplay reduces the effectiveness of fertilization.

An ideal soil contains a nice balance between its sand, clay and organic matter content so as to allow the free movement of water, air, and plant roots throughout its mass.

Most poor soils under cultivation are very often unproductive because they are poorly drained and this condition is traceable in a majority of cases to an accumulation of clay in the subsoil. Such an accumulation of clay will not allow the free movement of water downward—or upward. It becomes either water-logged during a wet season or very dry during a drouth. Roots cannot penetrate deeply in poorly drained soils, and as a consequence do not get enough plant food, become stunted and the growth of the vegetative part of the plant is limited.

The other items in the above list do not need much elaboration.

It is obvious that, under the conditions prevailing among most farmers, the returns from commercial fertilizers, for each dollar invested, are not as high as they should be, because of the limitations placed upon the productive capacity of the soil by the several factors already enumerated. True, there are some differences as to quality among the large number of fertilizer brands sold. These differences, however, are not in themselves sufficient to overcome the adverse effects of all these other factors. Until the physical and biological factors are favorable, the chemical factors, represented by the fertilizer and lime, cannot do their best job.

BUYERS' GUIDE

A CLASSIFIED INDEX TO ALL THE ADVERTISERS IN "THE AMERICAN FERTILIZER"

This list contains representative concerns in the Commercial Fertilizer Industry, Including fertilizer manufacturers, machinery and equipment manufacturers, dealers in and manufacturers of commercial fertilizer materials and supplies, brokers, chemists, etc.
For Alphabetical List of Advertisers, see page 33.

ACID BRICK
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

ACID EGGS
Chemical Construction Corp., New York City.

ACIDULATING UNITS
Chemical Construction Corp., New York City.
Sackett & Sons Co., The A. J., Baltimore, Md.

AMMO-PHOS
American Cyanamid Co., New York City.

AMMONIA—Anhydrous
Barrett Division, Allied Chemical & Dye Corp., New York City
DuPont de Nemours & Co., E. I., Wilmington, Del.
Hydrocarbon Products Co., New York City.

AMMONIA LIQUOR
Barrett Division, Allied Chemical & Dye Corp., New York City
DuPont de Nemours & Co., E. I., Wilmington, Del.
Hydrocarbon Products Co., New York City.

AMMONIA OXIDATION UNITS
Chemical Construction Corp., New York City.

AMMONIATING EQUIPMENT
Sackett & Sons Co., The A. J., Baltimore, Md.

AMMONIUM NITRATE SOLUTIONS
Barrett Division, Allied Chemical & Dye Corp., New York City

AUTOMATIC ELEVATOR TAKEUPS
Sackett & Sons Co., The A. J., Baltimore, Md.

BABBITT
Sackett & Sons Co., The A. J., Baltimore, Md.

BAGS AND BAGGING—Manufacturers
Bagpak, Inc., New York City.
Bemis Bro. Bag Co., St. Louis, Mo.

BAGS—Cotton
Bemis Bro. Bag Co., St. Louis, Mo.

BAGS—Paper
Bagpak, Inc., New York City.
Bemis Bro. Bag Co., St. Louis, Mo.

BAGS (Waterproof)—Manufacturers
Bemis Bro. Bag Co., St. Louis, Mo.

BAGS—Dealers and Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

BAGGING MACHINES—For Filling Sacks
Atlanta Utility Works, East Point, Ga.
Bagpak, Inc., New York City.
Sackett & Sons Co., The A. J., Baltimore, Md.

BAG PILERS
Link-Belt Company, Philadelphia, Chicago.

BEARINGS
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

BELT LACING
Sackett & Sons Co., The A. J., Baltimore, Md.

BELTING—Chain
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

BELTING—Leather, Rubber, Canvas
Sackett & Sons Co., The A. J., Baltimore, Md.

BOILERS—Steam
Atlanta Utility Works, East Point, Ga.

BONE BLACK
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Huber & Company, New York City.

BONE PRODUCTS
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

BORAX AND BORIC ACID
American Potash and Chem. Corp., New York City.
Pacific Coast Borax Co., New York City.

BROKERS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Dickerson Co., The, Philadelphia, Pa.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
Keim, Samuel L., Philadelphia, Pa.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

BUCKETS—Elevator
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

A Classified Index to Advertisers in "The American Fertilizer"

BUYERS' GUIDE

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BUCKETS—For Hoists, Cranes, etc., Clam Shell, Orange Peel, Drag line, Special; Electrically Operated and Multi Power
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.

BURNERS—Sulphur
Chemical Construction Corp., New York City.

BURNERS—Oil
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.

CABLEWAYS
Hayward Company, The, New York City.

CARBONATE OF AMMONIA
American Agricultural Chemical Co., New York City.
DuPont de Nemours & Co., E. I., Wilmington, Del.

CARS—For Moving Materials
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CARTS—Fertilizer, Standard and Roller Bearing
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

CASTINGS—Acid Resisting
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Duriron Co., Inc., The, Dayton, Ohio.

CASTINGS—Iron and Steel
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CEMENT—Acid-Proof
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

CHAIN DRIVES—Silent
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHAINS AND SPROCKETS
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHAMBERS—Acid
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

CHEMICAL APPARATUS
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Duriron Co., Inc., The, Dayton, Ohio.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

CHEMICALS
American Agricultural Chemical Co., New York City.
American Cyanamid Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Division, Allied Chemical & Dye Corp., New York City
Bradley & Baker, New York City.
DuPont de Nemours & Co., E. I., Wilmington, Del.
Huber & Company, New York City.

CHEMICALS—Continued
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Phosphate Mining Co., The, New York City.
Wellmann, William E., Baltimore, Md.

CHEMICAL PLANT CONSTRUCTION
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHEMISTS AND ASSAYERS
Gascoyne & Co., Baltimore, Md.
Shuey & Company, Inc., Savannah, Ga.
Stillwell & Gladding, New York City.
Wiley & Company, Baltimore, Md.

CLUTCHES
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CONCENTRATORS—Sulphuric Acid
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

CONDITIONERS AND FILLERS
American Limestone Co., Knoxville, Tenn.
Dickerson Co., The, Philadelphia, Pa.
Phosphate Mining Co., The, New York City.

CONTACT ACID PLANTS
Chemical Construction Corp., New York City.

COPPER SULPHATE
Tennessee Corporation, Atlanta, Ga.

COTTONSEED PRODUCTS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

CRANES AND DERRICKS
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

CYANAMID
American Agricultural Chemical Co., New York City.
American Cyanamid Co., New York City.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Jett, Joseph C., Norfolk, Va.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

DENS—Superphosphate
Chemical Construction Corp., New York City.
Stedman's Foundry and Mach. Works, Aurora, Ind.

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DISINTEGRATORS
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

DRYERS—Direct Heat
Sackett & Sons Co., The A. J., Baltimore, Md.

DRIVES—Electric
Link-Belt Company, Philadelphia, Chicago.

DUMP CARS
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

DUST COLLECTING SYSTEMS
Sackett & Sons Co., The A. J., Baltimore, Md.

ELECTRIC MOTORS AND APPLIANCES
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

ELEVATORS
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

ELEVATORS AND CONVEYORS—Portable
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

ENGINEERS—Chemical and Industrial
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

ENGINES—Steam
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

EXCAVATORS AND DREDGES—Drag Line and Cableway
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Link Belt Speeder Corp., Chicago, Ill., and Cedar Rapids, Iowa.

FERTILIZER MANUFACTURERS
American Agricultural Chemical Co., New York City.
American Cyanamid Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Farmers Fertilizer Co., Columbus, Ohio
International Minerals & Chemical Corporation, Chicago, Ill.
Phosphate Mining Co., The, New York City.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.

FISH SCRAP AND OIL
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

FOUNDERS AND MACHINISTS
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

GARBAGE TANKAGE
Wellmann, William E., Baltimore, Md.

GEARS—Machine Moulded and Cut
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

GEARS—Silent
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

GELATINE AND GLUE
American Agricultural Chemical Co., New York City.

GUANO
Baker & Bro., H. J., New York City.

HOISTS—Electric, Floor and Cage Operated, Portable
Hayward Company, The, New York City.

HOPPERS
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

IMPORTERS, EXPORTERS
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Wellmann, William E., Baltimore, Md.

IRON SULPHATE
Tennessee Corporation, Atlanta, Ga.

INSECTICIDES
American Agricultural Chemical Co., New York City.

LACING—Belt
Sackett & Sons Co., The A. J., Baltimore, Md.

LIMESTONE
American Agricultural Chemical Co., New York City.
American Limestone Co., Knoxville, Tenn.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
McIver & Son, Alex. M., Charleston, S. C.
Wellmann, William E., Baltimore, Md.

LOADERS—Car and Wagon, for Fertilizers
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Acid Making
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.
Duriron Co., Inc., The, Dayton, Ohio.
Fairlie, Andrew M., Atlanta, Ga.
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Coal and Ash Handling
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Elevating and Conveying
Atlanta Utility Works, East Point, Ga.
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Grinding and Pulverizing
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

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MACHINERY—Power Transmission
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Pumping
Atlanta Utility Works, East Point, Ga.
Duriron Co., Inc., The, Dayton, Ohio.

MACHINERY—Tankage and Fish Scrap
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MAGNETS
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MANGANESE SULPHATE
McIver & Son, Alex. M., Charleston, S. C.
Tennessee Corporation, Atlanta, Ga.

MIXERS
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

NITRATE OF SODA
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Division, Allied Chemical & Dye Corp., New York City
Bradley & Baker, New York City.
Chilean Nitrate Sales Corp., New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

NITRATE OVENS AND APPARATUS
Chemical Construction Corp., New York City.

NITROGEN SOLUTIONS
Barrett Division, Allied Chemical & Dye Corp., New York City

NITROGENOUS ORGANIC MATERIAL
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
DuPont de Nemours & Co., Wilmington, Del.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Smith-Rowland Co., Norfolk, Va.
Wellmann, William E., Baltimore, Md.

NOZZLES—Spray
Monarch Mfg. Works, Philadelphia, Pa.

PACKING—For Acid Towers
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

PANS AND POTS
Stedman's Foundry and Mach. Works, Aurora, Ind.

PHOSPHATE MINING PLANTS
Chemical Construction Corp., New York City.

PHOSPHATE ROCK
American Agricultural Chemical Co., New York City.
American Cyanamid Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Charleston Mining Co., Inc., Richmond, Va.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Phosphate Mining Co., The, New York City.
Ruhm, H. D., Mount Pleasant, Tenn.
Schmaltz, Jos. H., Chicago, Ill.
Southern Phosphate Corp., Baltimore, Md.
Taylor, Henry L., Wilmington, Del.
Wellmann, William E., Baltimore, Md.

PIPE—Acid Resisting
Duriron Co., Inc., The, Dayton, Ohio.

PIPES—Chemical Stoneware
Chemical Construction Corp., New York City.

PIPES—Wooden
Stedman's Foundry and Mach. Works, Aurora, Ind.

PLANT CONSTRUCTION—Fertilizer and Acid
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

POTASH SALTS—Dealers and Brokers
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
Schmaltz, Jos. H., Chicago, Ill.
Taylor, Henry L., Wilmington, Del.
Wellmann, William E., Baltimore, Md.

POTASH SALTS—Manufacturers
American Potash and Chem. Corp., New York City.
Potash Co. of America, New York City.
Union Potash & Chemical Co., Chicago, Ill.
United States Potash Co., New York City.

PULLEYS AND HANGERS
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

PUMPS—Acid-Resisting
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Duriron Co., Inc., The, Dayton, Ohio.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

PYRITES—Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., New York City.
Wellmann, William E., Baltimore, Md.

QUARTZ
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.

RINGS—Sulphuric Acid Tower
Chemical Construction Corp., New York City.

ROUGH AMMONIATES
Bradley & Baker, New York City.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

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SCALES—Including Automatic Bagging
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

SCRAPERS—Drag
Hayward Company, The, New York City.

SCREENS
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

SEPARATORS—Air
Sackett & Sons Co., The A. J., Baltimore, Md.

SEPARATORS—Including Vibrating
Sackett & Sons Co., The A. J., Baltimore, Md.

SEPARATORS—Magnetic
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

SHAFTING
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

SHOVELS—Power
Link-Belt Company, Philadelphia, Chicago.
Link-Belt Speeder Corp., Chicago, Ill., and Cedar Rapids, Iowa.
Sackett & Sons Co., The A. J., Baltimore, Md.

SPRAYS—Acid Chambers
Monarch Mfg. Works, Inc., Philadelphia, Pa.

SPROCKET WHEELS (See Chains and Sprockets)

STACKS
Sackett & Sons Co., The A. J., Baltimore, Md.

SULPHATE OF AMMONIA
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Division, Allied Chemical & Dye Corp., New York City
Bradley & Baker, New York City.
Huber & Company, New York City.
Hydrocarbon Products Co., New York City.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

SULPHUR
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Freeport Sulphur Co., New York City.
Texas Gulf Sulphur Co., New York City.

SULPHURIC ACID
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Taylor, Henry L., Wilmington, N. C.

SULPHURIC ACID—Continued
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Wellmann, William E., Baltimore, Md.

SUPERPHOSPHATE
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Taylor, Henry L., Wilmington, N. C.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Wellmann, William E., Baltimore, Md.

SUPERPHOSPHATE—Concentrated
Armour Fertilizer Works, Atlanta, Ga.
International Minerals & Chemical Corporation, Chicago, Ill.
Phosphate Mining Co., The, New York City.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.

SYPHONS—For Acid
Monarch Mfg. Works, Inc., Philadelphia, Pa.

TALLOW AND GREASE
American Agricultural Chemical Co., New York City

TANKAGE
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Smith-Rowland, Norfolk, Va.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

TANKAGE—Garbage
Huber & Company, New York City.

TANKS
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Sackett & Sons Co., The A. J., Baltimore, Md.

UREA
DuPont de Nemours & Co., E. I., Wilmington, Del.

UREA-AMMONIA LIQUOR
DuPont de Nemours & Co., E. I., Wilmington, Del.

VALVES—Acid-Resisting
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Duriron Co., Inc., The, Dayton, Ohio.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

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